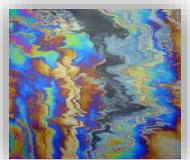


INVESTIGATE



REMEDIATE



REGENERATE

TECHNICAL REPORT

REMEDIATION STATEMENT
FOR
FORMER HARE HILL MILL,
HARE HILL ROAD, LITTLEBOROUGH,
ROCHDALE, GREATER MANCHESTER
FOR
WIGGETT CONSTRUCTION LIMITED

REPORT NO. 6461G
JANUARY 2019

SUB SURFACE NORTH WEST LIMITED
3 Peel Street
Preston
Lancashire
PR2 2QS
Tel: (01772) 561135 Fax: (01772) 204907
Email: preston@subsurface.co.uk

CONTENTS

1. INTRODUCTION	1.1 Site Location and Description
	1.2 Proposed Development
	1.3 Summary of the Phase I Walkover Survey and Desk Study
	1.4 Summary of the Phase II Ground Investigations
	1.5 Conceptual Ground Model
2. REMEDIATION	2.1 Contamination
	2.2 Ground Gas
	2.3 Site Operatives
	2.4 Validation Report
	2.5 General
APPENDICES	Correspondence with the Regulators
	Figures

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

**REMEDIATION STATEMENT FOR FORMER HARE HILL MILL,
HARE HILL ROAD, LITTLEBOROUGH, ROCHDALE, GREATER MANCHESTER**

CLIENT: WIGGETT CONSTRUCTION LIMITED

ENGINEER: BUILD VISION CONSULTING ENGINEERS

---

1. INTRODUCTION

Our brief is to provide a Phase III Remediation Statement in order that the Planning Application for the proposed development can be approved by the Regulators. Correspondence related to this is appended. We have prepared this Remediation Statement following a verbal instruction from the Client.

The Engineer has prepared and issued a report for the site, as follows:

- 1176 dated February 2016: Phase I: Walkover Survey and Desk Study.

We have also prepared and issued reports for the site, as follows:

- 6461 dated February 2018: Phase II: Ground Investigation.
- 6461A dated April 2018: Phase II: Ground Investigation (Addendum).
- 6461B dated December 2018: Phase II: GI & Phase IV Validation.
- 6461C dated November 2018: Phase II: Ground Investigation.
- 6461D dated December 2018: Phase II: Ground Investigation (Addendum).

The above reports should be read in conjunction with this Phase III Remediation Statement.

1.1 Site Location and Description

The former Hare Hill Mill site is to the north east of Hare Hill Road, Littleborough, Rochdale, Greater Manchester, as indicated on Figure 1. The approximate National Grid Reference of the centre of the site is SD.9360 1661.

As shown on Figure 2, the about 0.79 hectare near 'L' shaped site is bounded to the south west by Hare Hill Road with parkland beyond, to the south east by houses off of Hare Hill Road, Pine Street and Sale Street, to the east by Littleborough Primary School and to the north east, north and north west by Hare Hill Park.

Prior to initiating the initial Phase II ground investigation all but the west north western third of the site was occupied by disused mill buildings, a tower and associated tanks with adjoining concrete and bituminous macadam surfaced roads and hardstandings. The west north western third of the site was covered by trees, saplings and low vegetation with an apparent car parking area adjoining Hare Hill Road. A near central bunded area, which was full of oil, was also present together with a number of retaining walls.

In the spring of 2018 demolition of buildings, with the exception of those along Hare Hill Road, took place and a second ground investigation was undertaken whilst earthworks continued. A existing site layout is as shown on the topographical survey, undertaken in December 2018, and this is given as Figure 4.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.2 Proposed Development

Initially it was proposed to demolish all of the buildings on the site with the exception of the two storey stone built office and buildings along Hare Hill Road and the two storey stone "Engine House" building to be retained and converted for residential purposes. The remainder of the site was to be developed by constructing twenty five houses with gardens, parking areas and access roads, as shown on Figure 3. However, the "Engine House" and the buildings along Hare Hill Road, with the exception of the office building, have been found to be unstable and are now to be replaced by new identical stone buildings.

1.3. Summary of the Phase I Walkover Survey and Desk Study

1.3.1 Historical Appraisal

The following is based on the Ordnance Survey plans given in the Phase I Report:

The earliest known development of the site was in the mid 1840s. The 1851 Ordnance Survey shows the original Hare Hill (Woollen) Mill to be occupying the north western half of the site. At this time the south eastern half of the site was undeveloped and the site was bounded to the south west by Hare Hill Road. Tenter Grounds, for drying cloth, were present to the south east and north west of the site and a Reservoir was present about 100 metres to the north of the site boundary.

By the 1893 Ordnance Survey Hare Hill Mills comprised two large mill buildings, an engine house, a tower, offices, two chimneys, two rectangular reservoirs and one circular gasometer or pond. The Tenter Grounds had been lost and much housing development had taken place to the south east. A Gas Works had also been established on the land beyond Hare Hill Road.

In the period up to the 1910 Ordnance Survey the south eastern half of the site was developed comprising a large mill building and smaller outbuildings. Houses adjoined the south eastern boundary and Hare Hill Park had been established to the north.

The 1930 Ordnance Survey shows additional development with mill buildings occupying virtually all but the most north westerly part, this area being occupied by a rectangular Reservoir. However, by the 1937 Ordnance Survey part of the mill adjoining Hare Hill Road had been demolished.

In the period up to the 1960 Ordnance Survey buildings within the north western half of the site were demolished leaving two rectangular water tanks and some apparent retaining walls.

The 1970 Ordnance Survey shows the on-site buildings to be a Textile Mill and the Gas Works beyond Hare Hill Road to have been demolished. However, large gasometers remained, these being removed in the mid to late 1970s. The reservoir about 100 metres to the north was also removed and area was apparently infilled and developed for housing.

By the 1988 Ordnance Survey the north eastern half of the central rectangular building had been demolished.

No significant changes to the site and its immediate surrounding area are shown on the remaining Ordnance Surveys up to 2015.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.3.2 Geological Appraisal

The following is a summary of the geological appraisal given in the 6461D Phase II Report.

The British Geological Survey (BGS) sheet, ref. Lancashire 81.SW, solid and drift edition at 1:10,560 scale dated 1924, indicates that all but the most north westerly part of the site is underlain by River Terrace deposits underlain by Carboniferous Lower Coal Measures strata at or about the Yard Coal seam horizon.

River Terrace deposits were expected to comprise predominantly granular deposits comprising gravelly silty sands and silty sandy gravels overlain by possibly clayey silts and/ or silty clays.

Carboniferous Lower Coal Measures strata were expected to comprise interbedded mudstones, siltstones and subordinate sandstones with the Yard Coal at relatively shallow depths below rockhead for all but the north western part of the site where it was anticipated to be absent.

The geological survey indicated that the Yard Coal seam would be underlain by about 21 metres of Woodhead Hill Rock (sandstone), about 14 metres of measures (mudstones and siltstones), a thin Marine Band (shells) and the Six Inch Mine Coal seam which marks the bottom of the Lower Coal Measures strata. The above were expected to be underlain by the Rough Rock (sandstone) of the Carboniferous Millstone Grit Formation.

Rock strata in the area were anticipated to be down dipping to the west at 1 in 12 (4.8^{o}) and be within a geological fault bounded block, the nearest geological faults being about 130 metres to the north east and about 300 metres to the south west of the site boundary.

1.3.3 Mining Appraisal

The following is a summary of the mining appraisal given in the 6461D Phase II Report.

There are no records of mineworkings beneath the site within the Coal Authority's records but the Coal Authority indicate that they believe there is coal at or close to the surface, which may have been worked at some time in the past, for which they have no record. This is because the site is in an old coal mining area and it is possible that the relatively shallow Yard Coal seam would have been mined prior to the Mines (Coal) Regulations Act of 1872, before which there was no statutory requirement to maintain and preserve plans of abandoned mines. Of those plans which were made it is likely that not all will have survived with time and hence shallow mineworkings may be present for which there is no record.

The Coal Authority also indicates that there is no current mining or proposals to mine coal beneath the site, although reserves of coal exist which could be mined in the future subject to feasibility, licences and planning consents. It was, however, noted that on 23 December 2015 all underground coal mining ceased in the UK.

The Coal Authority are not aware of any recorded abandoned mine entries within the site or within 20 metres of the site boundary. However, the Coal Authority records may be incomplete and hence mine entries may be present for which the Coal Authority has no knowledge.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.3.4 Environmental Appraisal

The following is based upon the Landmark Sitecheck Report dated 13 April 2015 given in the Phase I Report. It should be noted that at the time of writing this section (January 2019) the site has been cleared for re-development.

The site was subject to contaminative land use by Adam Polymer Limited and Proofings Coated Fabrics who were registered at 64 Hare Hill Road, Littleborough. The contaminative land uses included:

- natural and man-made textile manufacture and products.
- oil, petroleum and gas refining and storage.
- none specified factory works.

A Gas Works, an Electrical Sub-station and tanks together with a substantial number of other potentially contaminative premises were historically present within 250 metres of the site. Two fuel filling stations were present between 250 and 500 metres of the site.

With regards to ground hazards on site there is a low potential for shrinking and swelling clays and a very low potential for landslides, running sand and collapses.

There are no BGS recorded or registered landfill sites, no licensed waste management facilities and no registered waste transfer, treatment or disposal sites within 500 metres of the site. The historical appraisal did, however, identify a potential unregistered landfill site (infilled reservior) about 100 metres to the north of the site.

One local authority pollution, prevention and control statutory authorisation was in place within the site.

Under the water industry act referrals, four discharge consents were in place with 250 metres of the site boundary.

There were no records of controls of industrial processes or storage of hazardous substances with 500 metres of the site.

With regards to contraventions there was one substantiated pollution incident registered between 250 and 500 metres of the site but no enforcements or prosecutions within 500 metres of the site.

There are no records of historical flood liability, flood defences, areas benefitting from flood defences or flood storage areas within the site but there are records of flooding and extreme flooding within 250 metres of the site.

No environmentally sensitive receptors were present within 250 metres and no protected countryside areas were present within 500 metres of the site.

A Minor Aquifer of variable permeability underlies the site and surface water features were present on the site. Groundwater abstraction from boreholes between 250 and 500 metres of the site were recorded; two to the south for industrial use and one to the south west for public supply.

There is a low probability of radon gas affecting this site as less than 1% of homes in the immediate area of the site have radon levels above the action level.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.4 Summary of Phase II Ground Investigations

1.4.1 Ground Conditions

To date two ground investigations have been completed. The first ground investigation, in December 2017, was undertaken in the north western half and central area of the site whilst the second ground investigation, in August and September 2018, was undertaken in the central area and south eastern half of the site.

The first ground investigation found interlayered very loose to very dense granular and extremely low to medium shear strength cohesive Made Ground to depths of between 0.40 and greater than 3.95 metres depth whilst the second ground investigation found generally medium dense granular and/ or low to high strength cohesive Made Ground to between 0.50 and 3.00 metres depth. No Made Ground, however, was found in the most northerly corner of the site.

Where the base of the Made Ground was proved in the first ground investigation interbedded very loose to very dense granular and very low to medium strength cohesive drift deposits were found to greater than 4.45 metres depth; no bedrock having been found.

The second ground investigation found in the south eastern part of the site generally very low to low strength amorphous peat, peaty clays and organic clays to between 1.50 and 3.00 metres depth. Elsewhere generally low, medium and high strength slightly gravelly to gravelly slightly sandy silty clays with cobbles was found to between 2.00 and 7.30 metres depth. Underlying the above were loose to very dense clayey silty or silty slightly sandy to very sandy gravels with variable cobbles, locally interbedded with silty sands and gravelly silty sands. Locally a layer of stiff gravelly sandy silty clay marked the base of the drift deposits at between 26.00 and 29.70 metres depth.

Bedrock was initially found to comprise siltstones and sandstones. The base of the Yard Coal seam at between 31.35 and 34.00 metres depth and mineworkings were considered to have been found, but are subject to further investigation. Just within the site entrance, midway along the south western site boundary, the 1.50 metre thick Yard Coal seam was found to be intact and comprised two leafs of shaley coal with a 0.60 metre thick sandstone parting. Largely sandstones were then found to up to 42 metres depth.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.4.2 Groundwater

The first ground investigation included TP1 at the north western corner of the site. A groundwater inflow in TP1 at 1.90 metres depth resulted in standing water being present on completion with a black oily sheen.

The second ground investigation included TP12 within the south eastern half of the site and midway along the north eastern site boundary. A groundwater seepage in TP12 at 2.10 metres depth was accompanied by a toluene odour . Slow to medium groundwater inflows were also recorded at between 3.45 and 5.00 metres depth in BH2, BH3A, BH6 and BH7 whilst a fast groundwater inflow was recorded at 8.00 metres depth in BH4. On encountering groundwater in the boreholes the water level rose from 0.45 to 1.00 metres in 20 minutes.

No groundwater was encountered in the remainder of the exploratory holes although it should be noted that the water flushing medium during rotary drilling may have masked water entries, the exploratory holes were only left open for a short period of time and groundwater levels and rates of inflow and may be subject to seasonal and/ or climatic variations.

Monitoring of standpipes installed in M1, M2A, M3, M4 and M5, between 5 January 2018 and 10 April 2018, found groundwater to be at 2.45 to 2.60, 0.30 to 1.40, 1.55 to 2.15, 0.20 to 0.70 and 0.35 to 2.20 metres depth respectively.

Monitoring of standpipes, installed in BH1, BH5/ R5, BH6A and BH7, between 14 September 2018 and 27 November 2018, found groundwater to be at 4.40, 2.60 to 2.85, 2.35 to 2.75 and 2.00 to 2.40 metres depth respectively.

1.4.3 Contamination

Soil:

Our assessment samples from the near surface Made Ground were for standard land use of residential with plant uptake

Our assessment for the first ground investigation found localised elevated levels of arsenic and lead, localised elevated levels of TPHs (C21 to C40), aliphatic TPHs (C8 to C12), aromatic TPHs (C8 to C35) and localised elevated levels of speciated PAHs.

Our assessment for the second ground investigation found localised elevated levels of arsenic, fairly widespread elevated levels of lead, localised elevated levels of aromatic TPHs (C12 to C35) and fairly widespread speciated PAHs.

The first ground investigation found volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) to exceeded their lower detection limits (no published guideline values). The above determinants were 1,3,5-trimethylbenzene (5,000µg/kg in M1), 2-methulnaphthalene (22mg/kg in M1 and 0.76mg/kg in M4), dibenzofuran (1.8mg/kg in M1) and isopropylbenzene (190µg/kg in M1).

The second ground investigation found semi-volatile organic compounds (SVOCs) in samples from TP14 (0.00m) and TP15 (0.00m) to exceeded their lower detection limits (no published guideline values). The above determinants were 2-methylnaphthalene (21 and 32 mg/kg), carbazole (1.7 and 1.2 mg/kg) and dibenzofuran (4.9 and 3.9 mg/kg).

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

Asbestos:

As part of the first ground investigation an asbestos screen was undertaken on ten soil samples and in one (TP6 at 0.50m to 0.70m) asbestos was detected. Analysis determined that fibres/ clumps of white (chrysotile) and brown (amosite) asbestos were present.

As part of the second ground investigation an asbestos screen was undertaken on eleven soil samples and two (SP4 at 0.00m and TP13 at 0.20m) asbestos was detected. Analysis determined that fibres of brown (amosite) asbestos were present in both samples.

Groundwater:

Five samples of groundwater taken from the standpipes installed in M1, M2A, M3, M4 and M5 on 16 January 2018 were analysed and in M4 the arsenic level exceeded the United Kingdom Drinking Water Standard only.

Four samples of groundwater, taken from the standpipes installed in BH1 on 14 September 2018 and BH5/ R5, BH6A and BH7 on 29 October 2018, were analysed. In BH7 the levels of total petroleum hydrocarbons (TPHs) exceeded the United Kingdom Drinking Water Standard (UK DWS) and toluene significantly exceeded the Environmental Quality Standard (EQS) and the World Health Organisation Drinking Water Guidelines (WHO). Further investigation and assessment is being undertaken given that they have vapour phases which may affect the development. This is detailed in the appended correspondence with the Regulator.

1.4.4 Ground Gas

Ground gas monitoring standpipes were installed and monitored on six scheduled occasions at about two weekly intervals in the first and second ground investigations.

The first ground investigation included monitoring standpipes installed in M1, M2A, M3, M4 and M5 between 5 January 2018 and 10 April 2018. No gas flows (< 0.1 litres/ hour), no elevated levels of methane (0.0%) and no elevated levels of carbon dioxide (0.0% to 0.9%) were detected but slightly depleted levels of associated oxygen (20.4% to 17.8%) were detected.

The second ground investigation also included monitoring standpipes installed in in BH1, BH5/ R5, BH6A and BH7, between 14 September 2018 and 27 November 2018. No gas flows (< 0.1 litres/ hour) and no elevated levels of methane (0.0%) were detected. However, elevated levels of carbon dioxide were detected in BH5/R5 (5.5% to 8.1%) and in BH7 (2.0% and 7.0%) throughout with similarly depleted levels of associated oxygen.

The levels of gas have been assessed in accordance with British Standard 8485, “Code of practice for the design of protective measures for methane and carbon dioxide gasses for new buildings”, published in June 2015 (BS.8485:2015). Based on all of the monitoring BS.8485: 2015, Table 2, indicates that the site falls into Characteristic Situation 1 (CS1). However, as carbon dioxide levels were found to be typically greater than 5% during the latter monitoring and the CS1 is increased by one to CS2.

BS.8485: 2015, Table 4, indicates that for a CS2 and the type of development proposed a score of 3.5 gives the level of protection and remedial measures required.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

1.5 Conceptual Ground Model

The conceptual ground model of a site has been updated with regards to contamination sources, pathways and receptors, following the ground investigation, as follows:

TABLE 1 CONCEPTUAL GROUND MODEL

Potential Source	**Nature of Hazard**	**Contaminants Associated with the Source**	**Pathway**	**Receptor**	**Mitigation Action**
Made Ground (localised)	Contaminants in Made Ground	Aromatic Total Petroleum Hydrocarbons (TPHs)	Ingestion of dust Dermal contact Inhalation of dust Inhalation of vapours	Site Operatives	Personal Protection Equipment (PPE) during “Hot Spot” removal.
Made Ground (widespread)	Contaminants in Made Ground	Arsenic Lead Polynuclear Aromatic Hydrocarbons (PAHs)	Ingestion of soil Ingestion of dust Ingestion of contaminated vegetable produce Dermal contact Inhalation of dust Inhalation of vapours	Site Operatives End Users	Personal Protection Equipment (PPE) Provide marker horizon and clean cover.
			Uptake via contaminated groundwater	Vegetation	Pit plant on and in clean topsoil
			Vertical and lateral movement of mobile contaminants to surface water and groundwater	Controlled Waters	Retain surface water on site and discharge groundwater from excavations in accordance with obtained Discharge Consent.
Asbestos on/ in ground	Asbestos fibres	Asbestos fibres	Inhalation of fibres	Site Operatives End Users	Personal Protection Equipment (PPE) Provide marker horizon and clean cover.

TABLE 1 (Cont'd) CONCEPTUAL GROUND MODEL

Potential Source	**Nature of Hazard**	**Contaminants Associated with the Source**	**Pathway**	**Receptor**	**Mitigation Action**
Landfills (within 250m of site) and deep Made Ground	Ground Gas (Asphyxiation, fire and explosion)	Methane Carbon Dioxide	Inhalation of gas Ignition of gas	Site Operatives End Users	Monitor before entering confined spaces. Provide gas prevention measures for houses
Spillage and/or leakage of organic liquid contaminants	Ground Gas (Asphyxiation, fire and explosion)	Aromatic Hydrocarbons	Inhalation of gas Ignition of gas	Site Operatives End Users	Monitor before entering confined spaces. Provide gas prevention measures for houses
Mining	Subsidence	-	-	Structures and services	##

Awaiting assessment of ground investigation and assessment.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

2. REMEDIATION

2.1 Contamination

2.1.1 Preparatory Works

Preparations for remedial works need to address issues of health and safety, pollution and nuisance in relation to site operatives, visitors to the site and associated plant, surrounding residents and the general public who may be affected by on-site works.

The site area should be made secure to prevent unauthorised access during site remediation works when contaminated materials are to be exposed. Access to site should be regulated by the site manager with records kept of on-site personnel and visitors, lorry movements, materials imported and exported from the site etc. This information should be made available for the Phase IV Validation Report.

2.1.2 Cover System

Elevated levels of aromatic and some aliphatic hydrocarbons were found in the area of M1, TP14 and TP15 and in the area of TP5, as shown on Figure 5. In view of the proposed development "hot spot" removal and validation should be undertaken.

Following the above, where buildings and hard surface cover are present, no other surface cover will be required as the pathway from the source to the receptor will be broken.

Following the above, where buildings and hard surface cover are not present, in order to break the pathway from the remaining contaminated soils (source) to the end users of the development (receptors) a 600mm blanket of clean topsoil/ subsoil should be placed in back gardens and a 450mm blanket of imported clean topsoil/ subsoil should be placed in front and side gardens and other open spaces. In addition deeper rooted bushes and trees should be pit planted on and in clean topsoil.

The thickness of clean topsoil/ subsoil placed in garden areas should be checked by taking out an appropriate number of hand dug trial pits. We understand that the Regulator will require one pit per 250 m^2 of garden. A photographic record should also be made during placement of the topsoil/ subsoil and/or during the trial pitting. The above information should form part of the Phase IV Validation Report.

Contamination analysis certificates for imported clean topsoil/ subsoil will be required. We understand that the Regulator will require one sample to be analysed for each 50m^3 brought to site. If certificates are not available then a sample should be obtained from the supplier and independent analysis undertaken. An independent appropriately qualified and experienced person should assess the results of the contamination analysis and determine whether it is suitable for use in the cover system.

It should be noted that the Regulator may request that an appropriately qualified and experienced person have a "watching brief" during the remediation and the observations of this person should be made available for the Phase IV Validation Report.

Transfer documentation for each load of clean topsoil/ subsoil imported to the site should be obtained and made available for the Phase IV Validation Report.

2.1.3 Waste Disposal

Classification of the waste should be undertaken prior to removing it to a licensed waste disposal facility. All vehicles carrying contaminated material should be securely sheeted and the wheels and undercarriages cleaned before leaving site to ensure that hazardous materials are not dropped onto public roads.

Transfer documentation for each load of contaminated material exported from the site should be obtained and made available for the Phase IV Validation Report.

The contamination analysis for groundwater to be disposed should be submitted to the appropriate authority or a waste disposal operator to determine the most cost effective method of disposal. Groundwater should not be removed from excavations and discharged to a sewer etc. without firstly obtaining a discharge consent from the appropriate waste water authority.

Discharge consents and/or transfer documentation for groundwater exported from the site should be obtained and made available for the Phase IV Validation Report.

2.2 Ground Gas

BS.8485: 2015 Tables 5, 6 and 7 indicate that for the levels of ground gas found on the site, a combination of the following protection and remedial measures should be considered to achieve the required score of 3.5 for the proposed houses:

Table 5 (a) precast suspended segmental sub-floor slab (block and beam).
(Score 0.0)

Table 5 (b) reinforced cast in-situ suspended floor slab with minimal penetrations.
(Score 1.0)

Table 5 (c) additionally reinforced cast in-situ suspended floor slab with minimal penetrations – slab of minimum 150mm thickness with reinforcement at the bottom and the top
(Score 1.5)

and ……

Table 6 (a) pressure relief pathway (low fines gravel blanket/ thin geocomposite blanket/ strips terminating in gravel trench external to the building)
(Score 0.5)

Table 6 (b) passive sub floor ventilation/ dispersal layer (clear void/ polystyrene void former/ geocomposite void former/ no fines gravel layer with gas drains/ no fines gravel layer) of very good performance.
(Score 2.5)

Table 6 (c) passive sub floor ventilation/ dispersal layer (clear void/ polystyrene void former/ geocomposite void former/ no fines gravel layer with gas drains/ no fines gravel layer) of good performance.
(Score 1.5)

and ……

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

Table 7 gas resistant membrane meeting the following criteria:

- sufficiently impervious to gases with a methane gas transmission rate of <40.0 ml/day/m^2/atm (average) for sheets and joints (tested in accordance with BS.ISO.15105-1 manometric method).
- sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions.
- sufficiently strong to withstand in-service stresses due to say settlement if placed below a floor slab.
- sufficiently strong to withstand the installation process and following trades (penetration from steel fibres in fibre reinforced concrete/ penetration from reinforcement ties/ tearing due to working above it or dropped tools) until covered.
- after installation being capable of providing a complete barrier to the entry of the relevant gas.
- verified in accordance with CIRIA C735 [N1].
  (Score 2.0)

…….....

The preferred option would be a combination of Table 5 (a), Table 6 (c) and Table 7.

Specifications and receipts for materials used in the gas remediation measures should be obtained and made available for the Phase IV Validation Report.

2.3 Site Operatives

Measures need to be put in place to prevent site operatives coming into direct contact with contaminated materials either by skin contact or by breathing in dust or vapours due to the elevated levels of hydrocarbons.

Site personnel involved in earthworks and excavations should be made aware of the hazards of working with contaminated materials found on site. Strict personal hygiene should be observed and gloves, overalls and boots should be worn. Washing and messing facilitates should be made available on site and smoking should be prohibited. In addition respirators should be available on site should there be a need to protect site personnel from the effects of potentially toxic vapours and gases.

Consideration needs to be given to site operatives who may be at risk from elevated levels of ground gas and/ or vapours or depleted levels of oxygen in confined spaces below ground. All excavations of greater than 1.20 metres depth should be routinely checked for air quality prior to man entry and appropriate precautions taken.

Any manholes, inspection chambers or other void spaces formed beneath the sites ground surface are potential ground gas traps. Precautions, as per the excavations above, should be taken.

2.4 Validation Report

On completion of the remedial works a Phase IV Validation Report should be produced by the independent suitably qualified person. The report should include records of on-site observations together with contamination analysis certificates, transfer notes, discharge consents, specifications etc.

2.5 General

It should be noted that an additional investigation of the retaining wall surrounded tanks in the area of M1, TP14 and TP15 (see Figure 5) was undertaken on 29 June 2018. This included the sampling of surface material around the tanks and the free phase liquids from within them followed by contamination analysis for waste disposal. A tank (see Figure 5) had also been recently removed and validation sampling was also undertaken on 29 June 2018 followed by contamination analyses to confirm no contamination remained. The above investigation and validation is given in our report, ref. 6461B dated December 2018.

This Phase III Remediation Statement should be submitted to the Regulator for approval before proceeding.

It should be noted that Phase II Ground Investigations are on-going in relation to mining and contaminated groundwater. On completion of the Phase II Ground Investigations this Phase III Remediation Statement should be revised accordingly and re-submitted to the Regulator for approval.

Following receipt of an instruction, we would be happy to validate the remedial works and prepare a Phase IV Validation Report on completion of the actions contained within the Phase III Remediation Statement.

We trust that this report fulfils your present requirements but if you have any queries or we can be of further assistance please contact the undersigned or Miss Anna Marsden at our Preston office.

SUB SURFACE CONSULTANTS LIMITED
REPORT No. 6461G
JANUARY 2019



A. J. Parker B.Sc.(Hons.), C.Geol., F.G.S.
Principal Geotechnical Engineer
For and on behalf of
Sub Surface Consultants Limited



C. A. Marsden B.Sc.(Hons.), C.Eng., M.I.C.E.
Director
For and on behalf of
Sub Surface Consultants Limited.

Sub Surface North West Limited
3 Peel Street, Preston, Lancashire, PR2 2QS
Tel: 01772 561135 Fax: 01772 204907 Email: preston@subsurface.co.uk

CORRESPONDENCE WITH REGULATOR

Subject: (6461G) Former Hare Hill Mill, Hare Hill Road, Littleborough, Rochdale, Greater Manchester

From: Michael Moore P <Michael.Moore@rochdale.gov.uk>
Sent: 24 December 2018 10:32
To: Sarah Griggs <Sarah.Griggs@bvconsulting.co.uk>
Cc: Mark Sexton (MSexton@wiggett.co.uk) <MSexton@wiggett.co.uk>; Sub Surface <preston@subsurface.co.uk>; 'Garry Griffiths' <garry@hna-architects.co.uk>; 'Sam Wiggett' <Sam@wiggett.co.uk>; 'Roy Finch' <Roy@wiggett.co.uk>
Subject: RE: Hare Hill Mill Development, Hare Hill Road, Littleborough, Rochdale [Filed 08 Jan 2019 15:57]

Sarah,

The proposals seem okay, with the caveat I have not read the SI reports to go with it.

I recommend you send the reports and proposal to the EA, in case they wish to comment.

Regards

Michael Moore P
Environmental Health Senior Officer (Environment Prot)
Public Protection

ROCHDALE
BOROUGH COUNCIL

01706 924107
07976 059366
michael.moore@rochdale.gov.uk

Rochdale Borough Council
Floor 3, Number One Riverside
Smith Street, Rochdale, OL16 1XU

To access our services go to www.rochdale.gov.uk
For news and social media updates go to www.rochdale.gov.uk/news

From: Sarah Griggs [mailto:Sarah.Griggs@bvconsulting.co.uk]
Sent: 21 December 2018 09:38
To: Michael Moore P
Cc: Mark Sexton (MSexton@wiggett.co.uk); Sub Surface; 'Garry Griffiths'; 'Sam Wiggett'; 'Roy Finch'
Subject: Hare Hill Mill Development, Hare Hill Road, Littleborough, Rochdale

Hi Michael,

Further to the initial Phase 2 Site Investigation carried out and submitted for the above site, further Phase 2 Site Investigation and Validation has been carried out after demolition of the former mill buildings at the site and please find attached the further groundwater investigation proposals from Sub Surface. I would appreciate it if you could please confirm if these are acceptable and if they can proceed with these as soon as you can please.

Please find below a dropbox link to a folder containing the further Phase 2 Site Investigation and Validation Reports referred to in the attached and the Phase 1 and initial Phase 2 submitted previously and the attached are also in the folder. 6461A is an update of 6461 and 6461D is an update of 6461C due to completing gas monitoring but I have included all reports for completeness.

https://www.dropbox.com/sh/111lvf33ou3kfbg/AACIw0kCJ-XVls_2NW7XKmTja?dl=0

Should you require any further information or if you would like to discuss anything please do not hesitate to contact me or David from Sub Surface.

If I don't speak to you before, have a lovely Christmas and all the best for 2019!

Regards

Sarah

Sarah Griggs
For and on behalf of
Build Vision
Consulting Engineers
Suite1, Westleigh House, Wakefield Road, Denby Dale, Huddersfield. HD8 8QJ. Tel: 01484 868257

Co. Reg. No 3140928 VAT Reg. No. 732 4887 15

SUB SURFACE CONSULTANTS
GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

Your ref: 16/00396/FUL

Our ref: DJ/6461F

Reg. Office
SUB SURFACE CONSULTANTS LTD.
3 PEEL STREET
PRESTON
PR2 2QS

Telephone: 01772-561135
Fax: 01772-204907
e-mail: preston@subsurface.co.uk
www.subsurface.co.uk

20th December 2018

Planning and Development
Rochdale Borough Council
Number One Riverside
Smith Street
Rochdale OL16 1XU

Dear Sirs,

RE: PROPOSALS FOR GROUNDWATER INVESTIGATION AT FORMER HARE HILL MILL, LITTLEBOROUGH.

We assume you have received copies of the following reports:

- Ground Investigation Report 6461 dated 6th February 2018
- Ground Investigation Addendum Report 6461A dated 17th April 2018
- Verification Report 6461B dated 5th December 2018
- Ground Investigation Report 6461C dated 23rd November 2018
- Gas Update Report 6461D dated 5th December 2018

We are undertaking site investigation work on behalf of Wiggett Construction Limited at the Former Hare Hill Site in Littleborough, Rochdale. In our initial investigation we have identified an elevated toluene concentration in the groundwater in the eastern extent of the site. The elevated concentration was found in BH7 the location of which is indicated on the attached Figure 1 and the suspected source is either spillage of toluene in the workshop previously occupying that part of the site or migrations of leaked toluene from a buried tank formerly located some 34m to the west of BH7 (as indicated on Figure 1). No elevated toluene was noted in the soil or groundwater in the previous borehole 6461_M5 taken out adjacent to the south east of the former tank. We understand from our Client's Engineer that on removal of the tank a substantial amount of material was excavated from the surrounding area and disposed of off site which may have remediated any soil source. We have undertaken sampling of the excavation faces and bases (as detailed in our Report No. 6461B) and no elevated hydrocarbons were found.

In order to assess the significance of the elevated toluene concentration in BH7 we intend to carry out the following further investigation and would welcome your comments on the proposals.

Directors: C.A. MARSDEN, B.Sc (Hons.) C. Eng., M.I.C.E. D.E. MARSDEN (Secretary)

We intend to take out a further five boreholes in the locations indicated on the attached Figure 1 in order to determine whether there is a source of toluene within the made ground derived from spillage outside of the former tank area. We will have an Engineer on site who will carry out PID headspace analyses on samples taken at 0.50m, 1.0m and then at intervals of 1.0m down to groundwater depths. In order to check if there is a significant soil source of toluene or other petroleum hydrocarbons we intend to undertake the following suite of analyses on the soil samples obtained from the boreholes:

- TPHCWG
- BTEX

The results of the PID readings will be used to target the soil testing. We will also undertake soil organic matter content analyses and take samples from cohesive strata to allow determination of the hydraulic conductivity if a Controlled Waters DQRA is ultimately required. In-situ tests can be carried out in the borehole standpipes at a later date to obtain hydraulic conductivity parameters for granular strata if required. In addition it is proposed to take out three hand dug pits in an area of ground formerly found to be contaminated with heavy carbon band hydrocarbons in the area of 6416C_TP14 and 6416C_TP15 in order to confirm that the contamination in this area was removed by the site strip.

Groundwater monitoring standpipes will be installed in all of the new boreholes. The boreholes have been positioned to determine whether a significant plume is present in the area of BH7 with BH105 intended to be a control and provide background hydrocarbon concentrations for the site. During the previous investigation no elevated hydrocarbons were found in the standpipes other than BH7. We intend to monitor and sample all available standpipes including 6461C_BH5, 6461C_BH6 and 6461C_BH7 from the previous investigation (6461C_BH2, 6461C_BH3 and 6461C_BH4 did not have installations and the 6461 mini boreholes and 6461C_BH1 are no longer intact). The wide spread of standpipes will allow for accurate determination of the groundwater gradient. After the results are in from the first monitoring and sampling visit we will re-assess the need to monitor and sample all standpipes. For the first two monitoring visits we will take samples for TPHCWG and BTEX analyses. If significant concentrations are found (when compared with WFD EQS and UK DWS) then on the third visit we will take samples for the following analyses:

- TPHCWG
- BTEX
- Iron (total and dissolved)
- Nitrate
- Sulphate
- Redox potential
- Conductivity

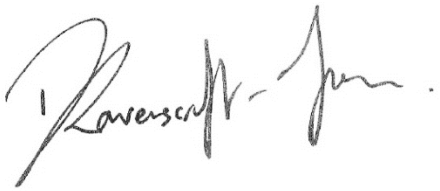
We also intend to monitor the standpipes for methane and to take PID readings. No free phase hydrocarbon product has been noted during previous monitoring visits, however if free product is noted or suspected then we will sample the free product and water separately. The BH7 standpipe was resampled for TPHCWG and BTEX analyses on Tuesday 11th December and we are awaiting the results.

On completion of the three months of monitoring, if the elevated toluene contamination is persistent a Controlled Waters DQRA will be carried out using the Environment Agency's Remedial Targets Methodology.

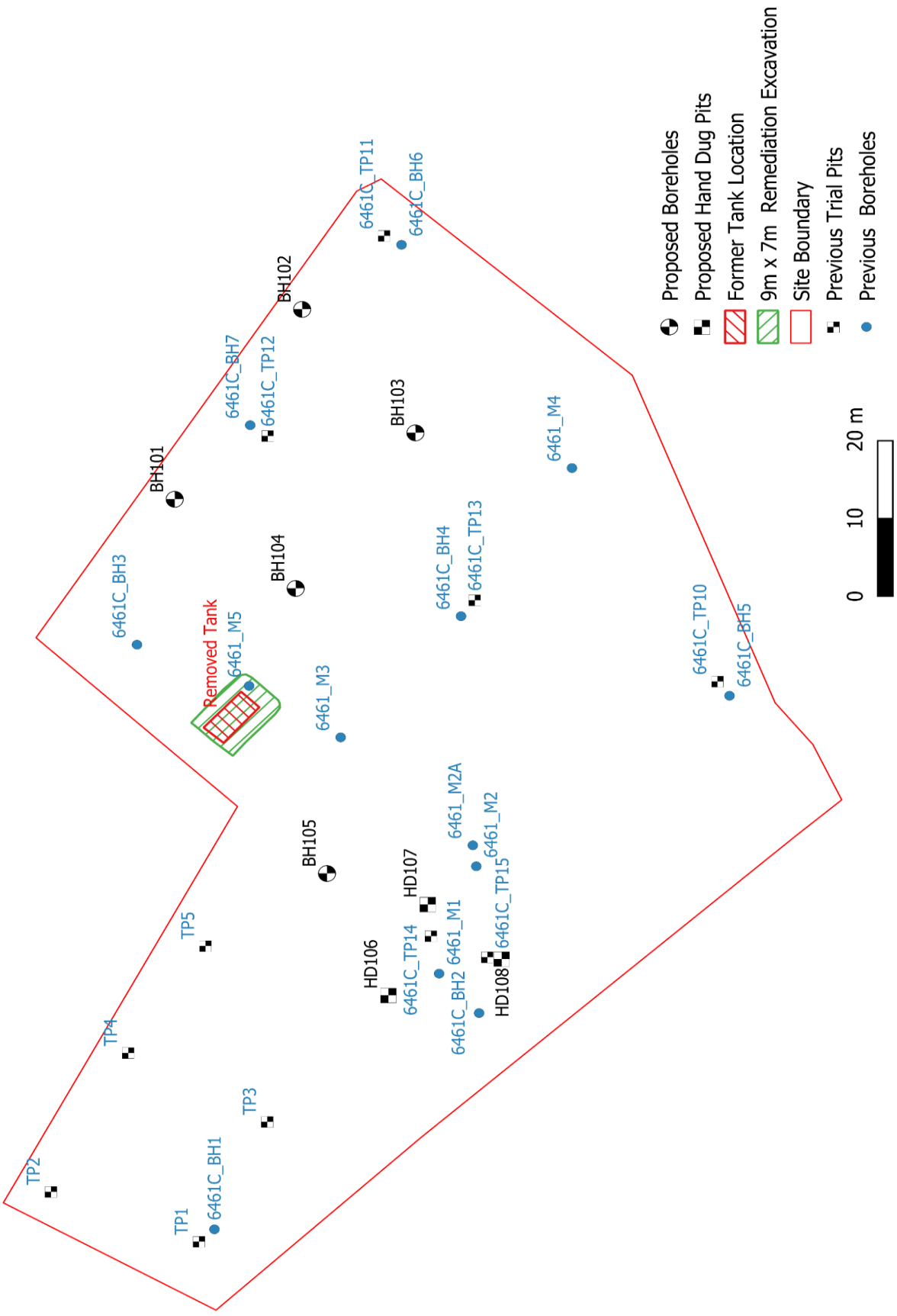
Our Client is keen to progress with the development and is proposing to commence with construction of Plots 1 to 7 in the north west of the site (indicated on Figure 2) while the groundwater investigation is being undertaken. In our opinion the proposed buildings will not significantly alter the groundwater regime on the site and as can be seen from Figure 2, the construction of Plots 1 to 7 will not interfere with the proposed or existing monitoring standpipes. Please can you confirm as a matter of urgency whether you would be happy for our Client to proceed on this basis as they are wishing to progress the development.

If you have any queries or require further assistance please do not hesitate to contact the undersigned or Miss Anna Marsden at our Preston office.

Yours faithfully,



David Ravenscroft-Jones BSc (Hons), MSc, Cert Nat Sci (Open), CEnv, MIEnvSc, MSEE,
Senior Geoenvironmental Engineer
For and on behalf of
Sub Surface Consultants Limited

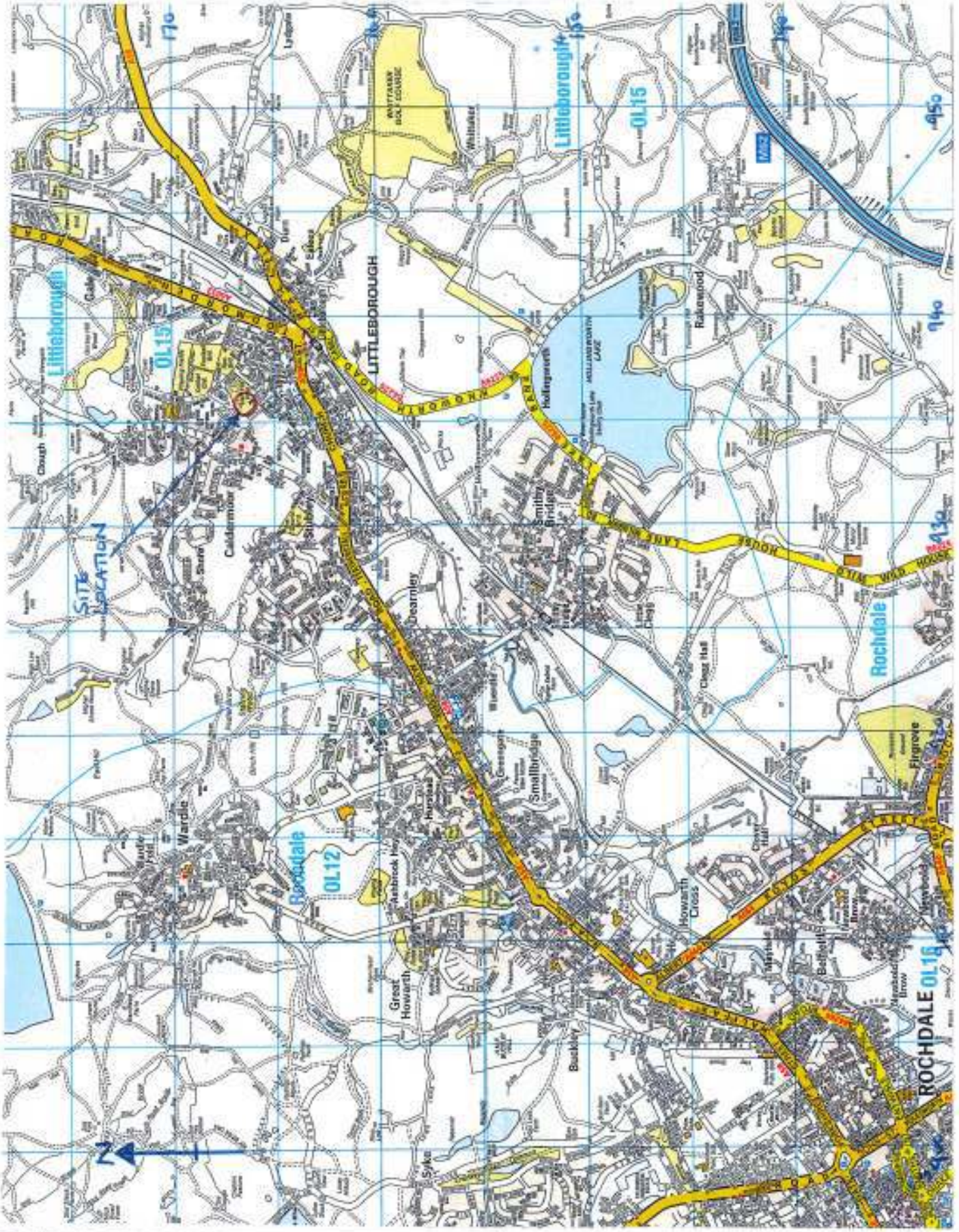


SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907		Proposed and Previous Exploratory Hole Locations		
Site FORMER HARE HILL MILL, LITTLEBOROUGH, GREATER MANCHESTER	Date Drawn 20/12/2018	Date Checked	Orientation N	Job No. 6461F
Client WIGGETT CONSTURCTION LIMITED	Drawn By DJ	Checked By	Scale	Figure No. 1



SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Proposed Development With Proposed Exploratory Hole Overlay			
Site FORMER HARE HILL MILL, LITTLEBOROUGH, GREATER MANCHESTER	Date Drawn 20-Dec-18	Date Checked	Orientation N	Job No. 6461F
Client WIGGETT CONSTURCTION LIMITED	Drawn By DJ	Checked By	Scale –	Figure No. 2

FIGURES



SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site Location Plan

Site	Date Drawn	Date Checked	Sheet	Job No.
FORMER HARE HILL MILL, HARE HILL ROAD, LITTLEBOROUGH, ROCHDALE, GT MANCHESTER	07-Nov-18		1 / 1	6461C
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
WIGGETT CONSTRUCTION LIMITED	AJP		1:25,000	1



REPRODUCED FROM THE ORDNANCE SURVEY WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE (LICENCE NO. 100031464)

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561136 Fax (01772) 204907

Site Boundary Plan

Site	Date Drawn	Date Checked	Sheet	Job No.
FORMER HARE HILL MILL, HARE HILL ROAD, LITTLEBOROUGH, ROCHDALE, GT MANCHESTER	07-Nov-18		1 / 1	6461C
Client	**Drawn By**	**Checked By**	**Scale**	**Figure No.**
WIGGETT CONSTRUCTION LIMITED	AJP		1:2,500	2



[Based on HNA Architects Drg. No. 1104/001, Revision G, dated 06/09/16]

SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907		Proposed Development Layout Plan		
Site FORMER HARE HILL MILL, HARE HILL ROAD, LITTLEBOROUGH, ROCHDALE, GT MANCHESTER	Date Drawn 30-Jan-19	Date Checked	Sheet 1 / 1	Job No. 6461E
Client WIGGETT CONSTRUCTION LIMITED	Drawn By AJP	Checked By	Scale 1:500 (at A3)	Figure No. 3

Topographical Survey Plan (Revision B, December 2018)

Job No.	Sheet	Scale	Figure No.
6461G	1 / 1	1:500 (at A3)	4

Date Drawn	Date Checked	Drawn By	Checked By
30-Jan-19		AJP	

SUB SURFACE
SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel: (01772) 561135 Fax (01772) 204907

Site
FORMER HARE HILL MILL, HARE HILL ROAD,
LITTLEBOROUGH, ROCHDALE, GT MANCHESTER

Client
WIGGETT CONSTRUCTION LIMITED

0 10 20 30 40 50m

SITE BOUNDARY

CHILDRENS PLAYGROUND
DENSE BUSHES
GRASS
AREA OF TREES
HARE HILL PARK
LAUREL HEDGE
CONC POST & WIRE FENCE
CONC POST & TIMBER RAIL
HARE HILL ROAD
ROAD UNDER CONSTRUCTION
OFFICES
MILL
CRUSHER STONE
TERRACED HOUSES
SALE STREET

Topographical Survey Legend

Bol	Bollard	MP	Mile post
Bin	Litter bin	Pt	Post
BL	Bed level	PM	Parking meter
BS	Box strap	PP	Power point
BT	British Telecom	RE	Rodding eye
Com	Security Camera	Ridge	Roof/ridge level
CATV	Cable television cover	RS	Road sign
CL	Cover level	Rwp	Rain water pipe
DR	Drain	SL	Soffit level
Elec	Electrical lc	Slab	Slab level
EC	Electric Cable	Stay	Cable stay
EL	Eaves level	Step	Step level
EP	Elec. pole	SV	Stop valve
ER	Earth rod	Svp	Soil pipe
FP	Flagpole	TL	Traffic light
FT	Floodlight	ToB	Top of Building
GY	Gully	ToW	Top of wall level
GP	Gate post	TP	Telegraph pole
GV	Gas valve	TS	Traffic Signal
FH	Hydrant	TT	Tac Tile
FL	Floor level	VP	Vent pipe
IC	Inspection cover	WL	Water level
IL	Invert level	WM	Water meter
LP	Lamp post	UTL	Unable to fit
MH	Manhole	ZCB	Zebra Crossing Beacon
Misc	Utility marker		

CTES SURVEYING
116 SOUTH ROAD, BRETHERTON, NR PRESTON, LANCS PR26 9AX
TEL No: 01772 683900
FAX No: 01772 683930
MOBILE No: 07973 672997
E MAIL: ctesurveys@yahoo.co.uk

CLIENT	WIGGETT
JOB TITLE	HARE HILL MILL HARE HILL ROAD,LITTLEBOROUGH

SCALE	DATE	JOB REF
1:500	JULY 2015	WC/HARE HILL MILL/B

REV A : RESURVEY JULY 2018
REV B : RESURVEY DEC 2018

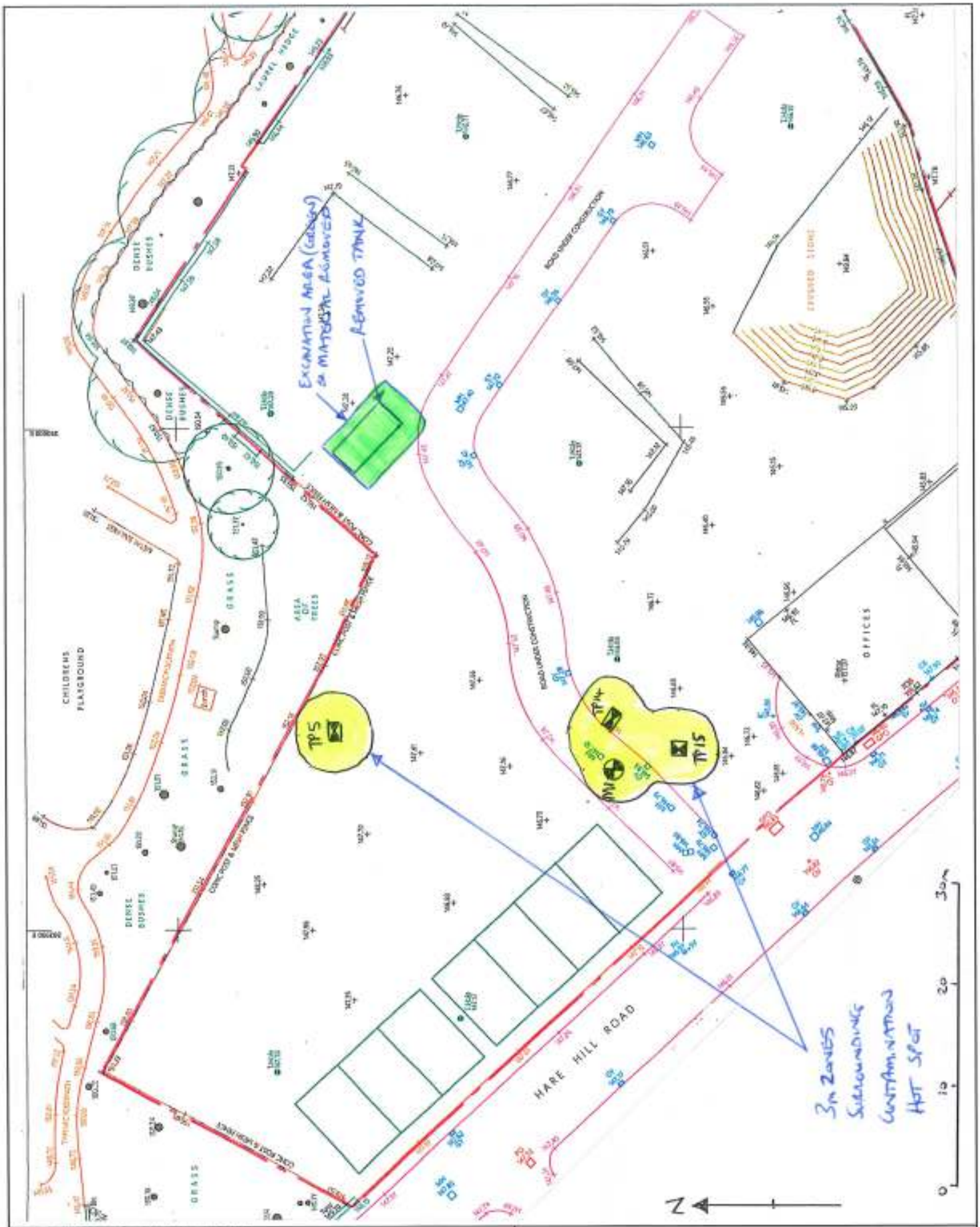
NOTES

ALL LEVELS ARE IN METRES RELATED TO ORDINANCE SURVEY LEVEL

ALL CO-ORDINATES ARE IN METRES RELATED TO NATIONAL GRID CO-ORDINATES FIXED BY G P S

ALL SERVICES & MANHOLES SHOWN VISIBLE AT TIME OF SURVEY

N



SUB SURFACE SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Areas to be Remediated by "Hot Spot" Removal			
Site FORMER HARE HILL MILL, HARE HILL ROAD, LITTLEBOROUGH, ROCHDALE, GT MANCHESTER	Date Drawn 31-Jan-19	Date Checked	Sheet 1 / 1	Job No. 6461G
Client WIGGETT CONSTRUCTION LIMITED	Drawn By AJP	Checked By	Scale 1:500	Figure No. 5